

RURAL ECONOMY AND CONNECTIVITY COMMITTEE

SALMON FARMING IN SCOTLAND

SUBMISSION FROM SEA CHANGE WESTER ROSS

Sea Change Wester Ross emerged as a community group set up to protect Wester Ross Marine Protected Area and give the public a voice for improved management of the marine environment. We speak for those in the community who care about the potential for recovery of the ecosystem, coastal economy and fisheries which are all interconnected. Since dredgers were banned, Sea Change has evolved into a think tank making our own conclusions on scientific and Government papers. These are often different from the prevalent Industry view, and sometimes also the authors. The context for our concern is that the greatest challenge our species is facing is to find solutions to rapid population expansion and an equally rapid loss of biodiversity combined with over fishing, global warming and ocean acidification.

The Government's intention to double salmon farms by 2030 ignores the limits of the ecosystem and the cumulative impacts it can absorb. Coastal economics in particular cannot be separated from the marine environment and many reports we have read focus exclusively on benefits to one industry and assume limitless capacity. Those of us in the think tank have an alternative coastal economy in mind - one built on an understanding of the interconnections within the ecosystem and true sustainability. This alternative economy would work with nature to build on the positive benefits restoration affords. Alistair Sinclair of the Scottish Creel Fishermen's Federation (the creel and dive fisheries) has spoken of a vision for an alternative coastal economy built upon support for low impact fisheries. We whole heartedly support this and it is with this in mind we outline our socio-economic review of Wester Ross (attached socio-economic report) which explores a specific case study and outlines the elements of this alternative economy. Our report is based on a specific salmon farm proposal, currently at the scoping stage and planned in the heart of the Summer Isles Archipelago which is within the Wester Ross Marine Protected Area. The MPA is designated because of its high biodiversity and maerl beds. Our 2018 socio-economic report reviews our former Socio-economic report presented in 2015 (which was based on the North-west Sea Lochs and Summer Isles BRAI). We ask that you take this report into account despite the length, as the research is as thorough and accurate as time allows. We recommend the Government commissions a full review based on the questions raised here, as well as reform of salmon aquaculture before any expansion is allowed.

There are short term gains to be reaped from doubling of Salmon farms and these may appear attractive. However the depletion of the environment on an industrial scale by multi-national salmon farm companies is on top of damage done by the mobile sector, and this cumulative impact cannot be ignored, for the ecosystem does not operate in isolation of different sectors. With this in mind we ask for this

committee's review to be a turning point with regards to the Marine Protected Area Network and specifically Wester Ross MPA. In our view the Scottish Government needs to urgently amend national marine planning guidance, so there is a presumption against any future salmon farming developments inside Marine Protected Areas. The Highlands does indeed need jobs. The question is more what kind of jobs and what economy is best to build? Our report hopes to provide some answers with regards to the alternative economy we envisage, which would be preferable to the one proposed economy based on salmon farm expansion at the cost of other businesses.

We would like it noted that we are unable to extrapolate the *full future benefits to the alternative economy of a robust recovery in the MPA* if the ecosystem and fisheries were properly protected and able to return to a previous, more abundant, baseline. (Which new Salmon Farms in the area, would be undermining). The potential of this recovery over a period of 5, 10 even 40 years is difficult to extrapolate. However it is important to start because this '*Alternative Economy*' is more likely to reap a sustainable future and we cannot allow this to be undermined by more salmon farms further depleting sea trout, wild salmon, creel and dive fisheries as well as tourism and other finfish fisheries and nursery grounds. Therefore, given the future socio-economic benefits of a full regeneration of the ecosystem cannot be assessed in the report - and the more immediate impacts are the focus of the case study, we believe this future potential is the full potential being undermined by the policy of salmon farm expansions, particularly in MPAs. Well protected MPAs around the world have shown, a great economic benefit for all. However well protected MPAs is the key to the benefit. We want Wester Ross MPA to demonstrate this full benefit, and if it proves successful it can be modeled across the west coast. Therefore we hope our socio-economic report attached serves, in part, as a microcosm for other areas and helps support a truly sustainable future for the sake of generations to come. Whatever the case, our report and what is outlined below questions the assumption that we need open cage salmon farming for jobs. Whilst there is uncertainty about the exact figures, we believe more salmon farms will produce a negative impact on jobs. Set this against the other global impacts of the industry and the environmental costs of feed and salmon farms global carbon footprint - an alternative economy as outlined in Sea Change's response looks very attractive indeed.

Marine Scientist, Professor Callum Roberts has this to say on Salmon Farms.

"The multiple environmental problems associated with open-cage salmon farming have been thoroughly established by scientific research. Individually, many impacts represent a serious risk to the conservation objectives of marine protected areas. Collectively, they guarantee an unacceptable level of impact. Open cage salmon farms are incompatible with the conservation objectives of protected areas and should not be sited within them."

The accumulated evidence in the ECCLR Committee's report (and other submissions to the committee) underwrite this statement and demonstrate beyond any reasonable doubt that open cage salmon farming has a negative impact on the marine environment. The many risks outlined in the report provide the Government with a warning. To proceed would be irresponsible as it risks damaging other fisheries and businesses which help the economy in the Highlands maintain some diversification. The only logical way forward for the industry is closed containment with fish welfare standards considered. To encourage this the Government could give incentive payments to encourage location in remote areas to support communities and the development of this technology.

The October 2016 Government and Industry's Aquaculture's growth plan to broadly double production by 2030 is not a viable option. It is neither sustainable nor likely to produce more jobs in the longer term, given the cumulative impacts. It is illogical to try and feed the world by undermining the ecosystem. The only way we will feed the world is to encourage the ecosystem's restoration and to support land based aquaculture which allows other truly sustainable fisheries to also provide food.

The report by Highlands and Islands Enterprise (HIE) and Marine Scotland called The value of Aquaculture to Scotland (June 2017) assesses 'impacts' but these are in fact benefits and there is almost no focus on costs to the economy from the displacement of creel and dive fisheries or other environmental impacts on wild finfish fisheries and tourism. The assumption is made over and over again in reports like these that open cage aquaculture provides a range of social and community benefits to fragile and remote areas where farms and related activities are located. Not one report to date has balanced these benefits by looking at the often subtle and slow accumulation of COSTS to other incomes. We hope to provide at least a good first attempt at evaluating these very real costs.

The North West has the most concentrated Salmon Farm production. The Highlands is therefore most at risk from this expansion yet the ecosystem and economy in the Highlands and Wester Ross in particular includes vulnerable habitats and species of socio economic importance and an MPA set up to protect and recover maerl which is very sensitive to impacts from salmon farms yet this is never acknowledged in these reports. I quote from the HIE report The value of Aquaculture to Scotland (june 2017) on page 9 in social and community impacts: "The employment that the sector provides in rural areas has helped to compensate for long term declines in agriculture and fishing employment as these sector have increased their productivity, whilst year -round employment offered by the sector has contributed towards the sustainability of family livelihoods, with tourism and agricultural employment in rural and remote areas highly seasonal. " It is true that jobs are needed outside of seasonal employment and salmon farms do provide this - but it is economical with the truth. It does not explain that salmon farming has in part contributed to this decline with creel fishing and a great deal with sea trout and salmon not to mention

others fisheries. It also does not mention that these fisheries are vulnerable themselves, and this is already fishing the bottom of the food chain. On page 11 the HIE report does at least acknowledge the problem of sea lice on wild fisheries yet not nearly enough given that the Salmon Fishery Stats for 2017 report that catch is 80% of the previous 5-year average and this is the fourth lowest on record.

If the wild fisheries were restored and a full recovery were supported by the Government this valuable wild fishery could help bring back many jobs to the region and could match the number of jobs supplied by the increasingly mechanical salmon farms - but in an ecologically sensitive manner.

<http://www.gov.scot/Publications/2018/04/2149/1> However the HIE report suggests salmon farming compensates rather than adds to the decline of some of the other industries in the area. This is simply not factual.

Our socio economic report is based on a case study concerned with 3 new or expanded salmon farms currently in scoping within the Wester Ross Marine Protected Area. However the study focuses on one particular new farm proposed by Scottish Sea Farms at Horse Island as an example of expansion leading to 3-5 new jobs and it explores the potential negative and cumulative impacts, where possible on other coastal jobs and income.

Fergus Ewing the Cabinet Secretary does not seem to have these other coastal businesses in mind. At the Seafood Expo in Brussels 24th April 2018 he ignored the evidence of the ECCLR committee report (unless he has plans for insisting upon closed containment) saying to salmon industry leaders: 'I'm determined to give what leadership I can to make sure that no matter what challenges are thrown at it you double growth.'

<https://www.fishupdate.com/minister-champions-salmon-sectors-growth/>
<https://www.fishfarmingexpert.com/article/cabinet-secretary-we-fully-support-2030-growth-plans/>

From the point of view of an observer looking at the facts at a local level this looks like regulatory capture, even if well intentioned. In our opinion this policy is misguided and does not serving the public benefit unless Mr Ewing does indeed intend to support a move on to land.

In the HIE report "summary of challenges and opportunities" on page 10 of the report it mentions the loss of jobs to mechanisation:

- Creating additional relatively skilled and well paid jobs.....as the sector grows through a transition from manual work to supervisory and technical roles as mechanisation increases - particularly in processing jobs.

In other words expansion creates more environmental damage for less jobs and the North west Highlands pays the price. In Wester Ross Scottish Sea Farms cannot recruit enough staff locally in the community and there have been recent departures of senior local staff. Often skilled jobs are brought in from outside of the area. There is no problem with that, but the alternative economy we speak of builds and expands upon the skills of existing local populations. One salmon farm might add a few jobs but a sea-safari business based on nature tourism or a cottage industry making crafts for tourists might add just as many jobs without damaging the environment and impacting other jobs. Scotland should not allow large Norwegian multinationals to exploit Scotland's natural assets with little concern for these jobs.

The HIE report on impacts/benefits was written before Scotland's salmon and trout farmers had to dispose of a record-high volume of 22,479 tonnes of dead fish in 2016 - so just as expansion was being planned, somewhere between six and ten million fish were being slaughtered according to newspaper reports. In Wester Ross, on the day Scottish Sea Farms held a community meeting to announce it's expansion plans for a new farm of around 2000 tonnes at Horse Island and an expanded farm at Tanera East (an amalgamation of existing smaller farms into one larger farm) - it shipped around 30 tonnes of dead salmon off the farms. According to eye witnesses, this made a stinking slimy mess of the local harbour which is used by creel boats and the local sea Safari's too - so visible to tourists. 25% of production in this year ended up incinerated. In other words it became rubbish. This was not intentional but this is no way to feed the world. Fish farm mortalities hit unwanted record in 2016 - FishFarmingExpert.com
<https://www.fishfarmingexpert.com/article/fish-farm-mortalities-hit-unwanted-record-in-2016/>

We believe this HIE report (June 2017) is inadequate for decision making. It has a flawed and unexamined premise and the evidence is partial throughout. It spends 95% of the time on impacts which are benefits from the industry and gives a very cursory glance at COSTS. This is partial and unfair. It cannot be used to make sound judgements, particularly when these judgements impact many other local people.

One of the environmental impacts it overlooks is outlined in the PAMP2 study (SARF/SAMS) which found that the use of emamectin benzoate correlated with a mean drop in crustacean numbers and abundance of about 60% outside the AZE. As well as perhaps 3/18 of its normal abundance in the most extreme examples. Prawns, crabs and lobsters are vital fisheries on the west coast. This is highly significant. Not only that, these toxic chemicals may stay in the environment and accumulate higher up the food chain.

A research paper from Chile and - chemical impacts on larvae of commercially-fished crabs backs the potential impact on this fishery up
[.https://www.fishfarmingexpert.com/news/recommended-lice-drug-doses-lethal-to-](https://www.fishfarmingexpert.com/news/recommended-lice-drug-doses-lethal-to-)

crab-larvae/ Published in July 2017 in Chemosphere 185 (2017) 1019-1029 called Lethal and sub-lethal effects of commonly used anti-sea lice formulations on non-target crab *Metacarcinus edwardsii* larvae.

In the SEPA's own internal report Options Paper (FOI) Q1 4-2, 132, released by SEPA June 2017, an aquaculture specialist wrote: '...the waters in which salmon farming is practiced are usually the same waters in which Scotland's valuable crustacean fisheries are located...' and '...it is not tenable for SEPA to adopt a position where commercial shellfish species are impacted by the day-to-day activities of fish farms, activities which SEPA will have knowingly authorisedSARF098 reveals that there is a significant risk of failure to provide such protection.'

THE REGULATORY REGIME

The regulatory regime is not sufficiently robust to reduce risks to other jobs as it has many failures. With self reporting, and no individual farm by farm lice reporting, and no prosecutions or penalties for known violations, and workers needing to handle toxic chemicals - there is inevitably little trust in the Government agency's willingness to hold companies to account. Furthermore as the ECCLR enquiry heard, both the autoDEPOMOD model and newDEPOMOD models are inadequate to assess impact in an MPA with maerl beds. Only hydrodynamic models are able to assess cumulative impacts in anywhere near the degree of accuracy needed to understand the very real situations on the west coast with multiple farms in the area as well as other fisheries.

INADEQUATE MODELLING OF IMPACT

In the Argyll and Bute's Council submission to ECCLR they note that all of the consents that have been granted to date depend on an outdated model of deposition (AUTODEPOMOD) that does not deal effectively with deposition in areas with irregular topography or high currents.

THE UNKNOWN EXTENT OF THE IMPACT ON CREEL FISHERIES

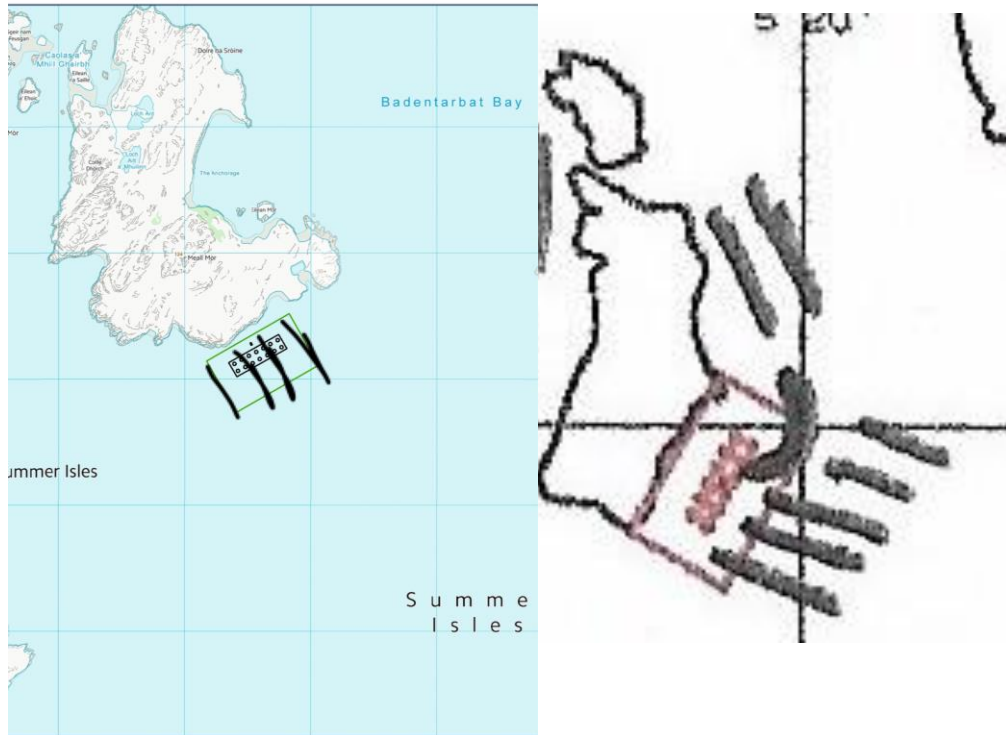
There are three open cage salmon farms in scoping proposed within Wester Ross MPA to add to the 7-8 active existing farms within the MPA (not to mention those on the borders which add to the cumulative impact) This means that the ground taken from creel fishermen at the heart of the Summer Isles is highly significant to these fishermen's incomes especially as these are within the best prawn fishing ground. These farms in total amount to over 100 hectares in size and this is just the ground that is taken by the cages and moorings. This does not include the Allowable Zone of Effect nor the unknown impacts outside of this which SEPAs existing model is not able to determine.

Extract from ECCLR report from SCFF

The Scottish Creel Fishermans' Federation highlighted concerns about the cumulative impacts of several farms in inshore areas and the impact of biomass and accumulation of waste. In written evidence they state that the total mass of emamectin benzoate increased six-fold between 2002 and 2015. They are concerned about the impact of this on arthropods (including prawns, lobster, crabs) and state the long-term effects of neurotoxin pesticides on scallops and mussels remain ill defined. Scallop stocks appear to be declining in areas with salmon farms. They also have serious concerns on the impact of anti sea lice formulations on target crab (*metocarcinus edwardii*). They consider there is too little independent research on bio-accumulation and on the longer term effects on inshore water ecosystems.

Sea Change fully support this statement. This is in view of the fact that there is also an increased likelihood of a toxic algae bloom due in part to increased water temperatures combined with added nutrients. Add to this concerns about sediment and chemical impacts on shellfish and the impact on habitats like maerl which are supportive of scallops, these expansion undermine creel grounds and deplete hand dived scallop jobs in the area, taking away from local communities. Whilst with salmon farming the financial value is transferred to mostly foreign owned multinationals.

The vast majority nearly 90 percent of fishermen are inshore. According to SCFF Creel boats make up 80% of the 1452 small fishing boats in Scotland's inshore commercial fishing fleet and generated £40.98 million for the Scottish Economy in 2015 most of them on the west coast lochs and inshore waters, most often in remote communities. For every boat it is estimated 3-4 permanent jobs are created in the supply chain. Just one large salmon farm can impact many fishermen across a wide area but particularly as the Scottish Sea Farm proposals looked at in the case study are directly on creel ground. See the next page maps for proposed farm at Tanera East and Horse Island sites with creel fleets marked.



Toxic chemicals degrade fisheries in sometimes subtle and invisible ways. How much, is still an unanswered question. Recent modeling shows that gross deposition can take place **3 or 4 km away** from the farm. It would be utterly irresponsible to proceed with the farms above. Land Containment is the only solution.

IMPACTS 3-4KM FROM THE SITE

I would like to refer to the more fully reported research in Sara Nason's response to the REC Committee which outlines in greater detail the impacts of salmon farms on maerl in as explained in "Investigation into the impact of marine fish farm deposition on maerl beds" which is a Commissioned Report No. 213 (2006) by SNH, SEPA and Marine Harvest.

The research says that the study was not designed to assess impacts on maerl beyond 100m. So it remains unknown if impacts extend beyond this distance as the research did not measure beyond this. To quote the report “ It should be noted that these distances represent the outer survey points on those transects and therefore it is likely that the footprint extends beyond this distance”

Hydrodynamic modeling of cumulative impacts may be a better model of impacts when there are many salmon farms in the area and even then the research is insufficient as it does not model impacts on maerl. Maerl is legally protected in order to recover it, so in theory no impacts are allowed. Equally extra nutrients in the water from salmon farms are not only likely to impact sea grass which impacts fisheries but also adds to the possibility of algae blooms which impact shellfish and there is no research on their impact on maerl as far as we know. There is no research that indicates what the safe distance of a salmon farm from a maerl bed is. So the precautionary principle must apply.

New or expanded Salmon farms will undermine the restoration of finfish fisheries and angling, creel and dive fisheries as well as nature and marine tourism which could become the building blocks for an alternative economy. This potential of regenerating an economy would be lost in the drive for ever larger salmon farms, combined with the existing impacts of the mobile sector on inshore waters.

IMPACT ON WESTER ROSS'S FISHERIES THROUGH IMPACT ON CONSERVATION FEATURES

The SAMS report (4.9) to ECCLR points out “there is significant coincidence between natural heritage values and site suitability for fish farming. This is because the requirements for a good farm site (high water quality; good water exchange; shelter; moderate depth) tend also to favour high levels of biodiversity.”

Richard Luxmore of the National Trust for Scotland says “with Reference to SARF 046 (the proximity of fish farms to protected features) predates the establishment of MPAs and there is virtually no consideration of this important impact. The mention of SEPA having “addressed Priority Marine Features (PMFs) and Marine Protected Areas (MPAs) with respect to fish farming in its interim EMB policy statement” is simplistic as it only addresses one aspect of the impact and, moreover, there is evidence the implementation of this guidance by SEPA has been inconsistent. The (SAMS) review has made no mention of the work by SNH and Marine Scotland in assessing the potential impact of aquaculture on PMFs (through the FEAST tool). This is an extraordinary omission, particularly in view of the urgent need to review this guidance.”

Research assessing the sensitivity of priority habitats, and Priority Marine Features (PMFs) to aquaculture is extremely limited. The report also points out that the

greatest concern is for burrowed mud habitats containing sea pen and burrowing megafaunal communities, Flame shell, Maerl beds. (Burrowed mud is a habitat for prawn fishery) given the inaccuracies of the dispersion modelling, Uncertain knowledge of rates of decay, which may vary substantially according to chemical and physical conditions; and the lack of knowledge of the bio-accumulation. EMB decays only slowly in sediment; it is especially toxic to crustaceans, but affects physiological processes more widely.

Maerl is highly sensitive to sediment smothering.

Wester Ross is one of only two MPAs with protection from dredgers and one of a handful of MPAs designated for maerl. Out of this handful of MPAs, it is one of the MPAs which has the most abundant maerl. It is to be noted that species of conservation importance which are protected in the MPA, often derive their importance from the fact they support high levels of biodiversity and are nursery grounds for a wide range of fisheries which in turn has economic benefit. Maerl is of European and international importance. Wester Ross MPA is not fully mapped for maerl and is one of the few MPAs with a real chance of recovery of fisheries due to the ban on dredgers creating an umbrella recovery effect for a broader range of species than those with legal conservation status. Whilst this is not perhaps the purpose of the MPA, it is of great importance to local fisheries and this makes Wester Ross highly significant within the whole MPA network.

The scientific intention behind the MPA network is good environmental status and recovery in order to seed other areas. If the Government were to allow time for MPAs to recover species and habitats then an alternative economy becomes viable.

Wester Ross MPA already has 7 or 8 active Salmon Farms (and sites not currently in use) It has more farms within a few kilometers of the border of the MPA and so cumulative impacts are important to assess, in order to know what the ecosystem can absorb. We are already fishing the bottom of the food chain with no fin-fish fisheries left and just prawns, crabs, lobsters and scallops. There is a real chance to restore fisheries over time, but this chance could be thrown away by the policy of doubling salmon farms.

CUMULATIVE IMPACTS OF SALMON FARMS ON PRIORITY MARINE FEATURES AND FISHERIES

Applications requiring Environmental Impact Assessment are required by the EIA Regulations to address cumulative impacts in association with other developments, so an applicant in an MPA would be expected to address not only wild fish interactions on a cumulative basis, but also these impacts on protected species. Yet there is inadequate research into salmon farm impacts on priority marine features. Maerl and flame shells support biodiversity and fisheries particularly scallops which are known to settle on maerl. Both maerl and flame shells have recover status in Wester Ross MPA.

Please note these issues below:

- Salmon farming in the MPA already takes place close to known maerl beds and flame shell beds.
- SEPA has recently set a much lower allowance for emamectin use within MPAs but as far as we know SEPA has given no instructions to limit the use of emamectin in the case of farms pre-existing the MPAs designation - this is deduced from the licence allowances on Aquaculture Scotland's website.
- Maerl has recover status. Kelp and seaweed communities on sublittoral sediment has conserve status. Both are near proposed farm sites in scoping.
- Marine Harvest's Salmon Farm in Loch Ewe is around 500 to 1 kilometer from a maerl bed. Given new accepted distances of impact could be impacted.
- In Loch Broom the salmon farm is less than a kilometer from flame shell beds, possibly closer. No research on impacts of salmon farms on flame shells is known to us and so impacts are impossible to know. There are only a few examples of flame shell beds in Scotland ...possibly only around 7-8 so this and other aspects of biodiversity are an attraction for recreational divers, and there are some who visit the MPA from Europe - degrading these can impact the diver attraction and fisheries. They have recover status.
- The Marine Harvest Salmon Farm in Loch Ewe has never passed it's benthic test. It also uses emamectin. We do not know what harm it has done to the maerl bed and other species. No research as far as we known covers this.
- Herring and other species may spawn on maerl beds too, which may improve their survival rates. Recently Winter Spawning Herring was recently found just south of the MPA probably targeting maerl beds. This was a vast 2km x 1km spawning ground for Winter Spawning Herring was found just south of the MPA in the Wester Ross economic zone near Gairloch - herring is an important fishery for recovery. Herring could - if allowed to recover - become one of Scotland's top fisheries again.
- There are other spawning and nursery grounds in inshore waters and we do not know what other species are impacted.
- Burrowed mud habitat with conserve status is also close to farms. The half life of emamectin benzoate is quoted variously as less than 180 days to 200 days (the latter D. Sinclair in the SEPA internal 'Options Paper'. SEPA modellers in publications assume that it won't have completely degraded in less than 4.5 years. Apparently it almost stops breaking down in the dark and anaerobic conditions - ie if buried in the seabed. (We imagine trawlers can re-suspend this if it ends up in the mud in this habitat and impact prawn stocks but we do not know?)
- Sea grass (a PMF) is highly sensitive to nitrogen in the water and may be vulnerable in Gruniard bay within the MPA to the gross organic output from farms.
- We also have wild wrasse being fished in order to supply Wester Ross Fisheries and other farms which is potentially leading to further in balance in the ecosystem and potentially knock on effect on the other fisheries.
- There is evidence that shellfish farming can be impacted by salmon farms too.

SEAGRASS - Tracking Nitrogen Source Using $\delta^{15}\text{N}$ Reveals Human and Agricultural Drivers of Seagrass Degradation across the British Isles Benjamin L. Jones^{1,2*}, Leanne C. Cullen-Unsworth^{1,2} and Richard K. F. Unsworth^{2,3} Sustainable Places Research Institute, Cardiff University, Cardiff, United Kingdom

TOURISM IMPACTS

The creel and dive fishery is a vital part of the socio-economic fabric of the community, however the Wester Ross economy is more dependent upon tourism for its survival. The ECCLR Committee's report on the environment gives evidence supplied by the Whale and Dolphin NGOs with regards to the impacts of shooting seals and Acoustic Deterrent Devices. These hurt whales, dolphins and porpoise which are the charismatic creatures loved by many tourists and residents alike.

The Hebridean Whale and Dolphin Trust submission to ECCLR committee says "Cetaceans serve as charismatic flagship species underpinning many financially important ecotourism activities in the region, such as whale watching, which in 2015 generated an estimated £3.7 million in indirect revenue from an estimated 51,200 whale-watching passengers on vessels operating on Scotland's west coast (Conor et al. 2018)."

With whale sightings are unpredictable and rare but seal haul out sites are a more reliable tourist attraction. However two of the Salmon farms in scoping in Wester Ross MPA have seal haul out sites extremely close to them and these seals risk being shot if the farms proceed. Sea safaris would lose their key attractions - with sea birds on the decline, this risks much reduced attractions for sea safaris. Cetaceans already suffer from a wide range of impacts such as ingested plastics, toxicity (PCB's), sound pollution and entanglement. We have a responsibility to these highly intelligent creatures to do no more harm. Their attraction to tourists has a significant economic implication.

See below a chart showing salmon farms in scoping with red crosses near seal haulouts

The list of companies operating within the Wester Ross Area focused on the MPA (from local sources)

Shearwater (former Summer Queen) cruises.

Seascope Expeditions

Summer Isles Sea Tours) - Isabella

Torridan Sea Tours Luxury Boat Trips - Sightseeing and Wildlife

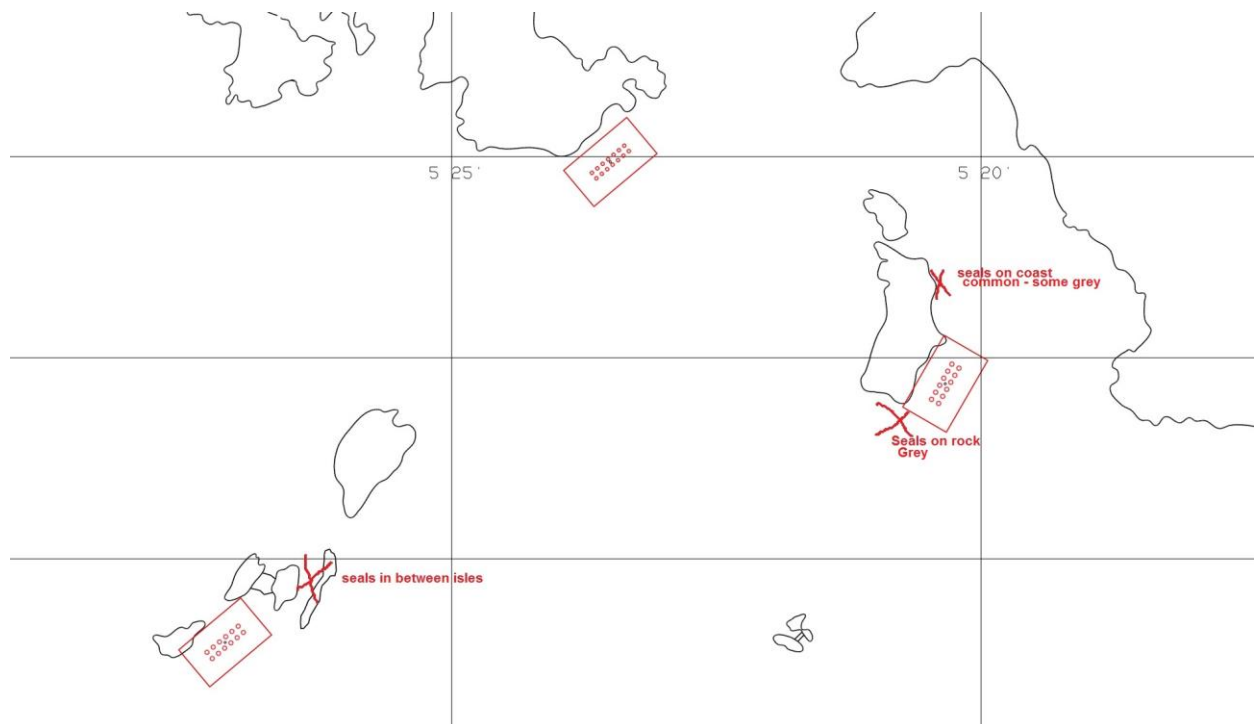
Sealife Glass Bottom Boat - Underwater wildlife viewing

Hebridean Whale Cruises - Whale watching and sea cruises

Many other companies involved in kayaking/ canoeing/shellfish safari's rely upon nature to add to their attraction to tourists - whilst this is to a lesser degree than the companies above the quality of their experience will be impacted by salmon farms.

THE ALTERNATIVE ECONOMY WE COULD RISK?

Awakening the Giant (a report on marine tourism) it says, by 2020 we want Scotland to be "A marine tourism destination of first choice for high quality, value for money and memorable customer experience delivered by skilled and passionate people"



Awakening the Giant, observes that the marine tourism sector has great potential for growth. This is a key strategy document for Scotland's marine tourism industry and appears to be incompatible with the Governments proposal to double fish farms. The National Strategy from Tourism Alliance: Tourism Scotland 2020 suggests we need to develop and deliver authentic, high quality memorable experiences. Small businesses in the highlands and islands, as well as sea safari companies, depend on tourism. The Government would be better off encouraging diverse enterprise around nature tourism and supporting restoration of the marine environment. Even a small weaving company which employs 5 people which has no environmental impacts may equal the number of employees from a fish farm but do no harm to others businesses jobs. Many testimonies to the ECCLR Committee support Awakening the Giant in terms of potential incomes. Sea safari operators such as David and Jean Ainsley in the Firth of Lorne, Whale and Dolphin NGO's also have presented

evidence to the Committee's on how marine tourism is harmed and jobs are impacted by Salmon Farms.

RECREATIONAL DIVING- THE IEEP - Institute for European Environmental Policy - Biodiversity Policy & Instruments. <http://www.ieep.eu/work-areas/biodiversity/nature-conservation-policy-and-its-implementation/2016/05/new-study-on-socio-economic-benefits-of-eu-marine-protected-areas> supplies evidence of how safeguarding MPA's can lead to improved socio-economic benefits with a very dive orientated approach. See 4.1 Marine protected areas and opportunities for nature-based tourism

4.2 Their findings suggest that scuba diving has a larger annual local economic impact than recreational fishing (€374,000 versus €71,000 for the 12 MPAs) and that incomes generated in the local area by ecosystem service users' activities (including professional fishing) are significantly higher than the yearly management costs of about €600,000 for the MPAs in question. The authors furthermore confirm that the "designation effect" – when designation of an MPA attracts visitors who come for the sake of experiencing the protected area – has been an important factor for attracting divers at these sites, although not as clearly influencing visits by recreational fishermen. See 4.1 Marine protected areas and opportunities for nature-based tourism figures.

VISUAL IMPACT

The visual impact could degrade the vistas of the famous Summer Isles Archipelago both from holiday cottages, restaurants, cafe's and sea safari boats and other marine activities that enjoy the views. This can also impact other marine activities that are either dependent on, or enhanced by sightings of sea mammals. The degree that this undermines tourism is very site specific but in An Assessment of the Benefits to Scotland of Aquaculture (April 2014) With reference to the socio-economic impact of salmon farms on tourism from the visual impact it says " Some studies have provided support for this concern: for instance a study that focused on the Outer Hebrides, Shetland and Oban and Mull found that approximately half of the visitors interviewed said that future expansion of fish farms would negatively impact their willingness to revisit the area 83. "

⁸³ Nimmo, F. Cappell, R. Huntington, T. Grant, A. (2011). Does fish farming impact on tourism in Scotland?. Aquaculture Research, 42: pp. 132-141.

This is a large number of visitors which could over time have a considerable economic cost.

Whilst the recovery of the areas fisheries is not the legal purpose of the MPA the community could look forward to both the 'umbrella effect' and the "designation effect". Yet with large Norwegian multi-nationals focusing their attention on MPAs as a means to expand and market the 'pristine seas' of Scotland this is less likely.

It will not be so easy to attract tourism to the 'pristine Marine Protected Area' and promote it as restoring the marine environment. This is especially in light of the rising level of public awareness of the negative impacts of Salmon farms on the environment. Sea Change looks forward to when the alternative economy is able to flourish; encouraging recreational divers; enhanced sales of seafood from the Marine Protected Area's; and further promotion of marine wild life and nature tourism. With a Sea Festival perhaps replacing the loss of sea angling jobs with nature tourism until these fisheries can be restored. The experience of tourists who are recreational divers, kayakers, snorkellers (snorkelling in sea grass and maerl) is important to preserve.

Aileen Robertson's submission to the ECCLR committee (about a dive company in Skye and refers to the experience of Dive & Sea the Hebrides) supports our view. No-one sees the damage to the environment more than divers and damage has been profound. Through benthic damage, ecosystem loss, habitat disruption, water column degeneration, and loss of amenity by physical exclusion from sites, there has been a continual need to adapt daily operations, travel further afield with significant time and cost implications, due to upscaling of vessels, extra fuel costs, extra daily work time. Very recently this has been further compounded by the granting of permission for a salmon farm directly adjacent to 2 key dive sites. This continual loss of popular and quality dive site is making the future of this company very uncertain. What message does this send to the local community and its younger population? It is no wonder that they leave. Unless they want to feed fish, there is no prospect for them at sea here.

Aileen Robertson's Submission shows a chart on page 4 with job losses. This indicates that there have been significant job losses from shellfish farmers to nature tourism attributed to Salmon Farming in the area.

TOURISM AND SEA ANGLING - LOCH MAREE AS AN EXAMPLE REPLICATED IN OTHER RIVER- LOCH SYSTEMS IN WESTER ROSS

The Scottish Government has recently acknowledged that sea lice come from salmon farms and cause the decline of wild salmon and sea trout in west coast rivers. Marine Scotland also pointed out recently in their submission to a planning application for a fish farm in Loch Duich: 'It should be noted that adherence to the suggested criteria for treatment of sea lice stipulated in the industry CoGP may not necessarily prevent release of substantial numbers of lice from aquaculture installations.'

The River Ewe and Loch Maree system is connected to the sea at Loch Ewe which is within the Wester Ross MPA. Until the 1990s, this was one of the most famous sea trout areas in Scotland. During the 1970s and 1980s, the Loch Maree Hotel employed 9 ghillies through the fishing season (April to October). Hotels in

Kinlochewe also employed several ghillies. In the film *The Demise of Loch Maree* made by the Salmon and Trout Conservation Trust it indicates the whole system has lost 20 seasonal jobs and 1 full time job still existing. This doesn't account for hotel jobs and other impacts etc. If these jobs could be restored this could match many of the jobs supplied by new or expanded salmon farms in the area.

It may be stretching things to suggest that Loch Maree is going to recover if the single Scottish Sea Farms development in Horse Island does not proceed, however the recovery of this fishery is a wider scale ambition to be addressed and is an impact likely to be caused by salmon farms.

The Scottish Government published peer reviewed science in 2013 - S. J. Middlemas et al 'Relationship between sea lice levels on sea trout and fish farm activity in Western Scotland' - this was from data collected by West Coast fishery trusts. The study revealed that sea lice infestations impact wild sea trout at a "critical level" within a 31km radius of a salmon farm. New farms need to account for cumulative impact in a wide radius.

The Little Gruinard river is a Special Area of Conservation (SAC) for Atlantic salmon; the river begins within the boundary of the MPA. It is the only SAC on the mainland of the NW of Scotland. Not only is there maerl in this area near Gruinard Island but it is just 14 km from the proposed 2000 Tonne Biomass Farm at Horse Island. And not far from Loch Ewe too.

A risk assessment carried out in Wester Ross for Managing Interaction Aquaculture (MIAP) Project 3 on locational guidance and Zones of Sensitivity showed Wester Ross MPA rated in the blue and purple category which is a mixture of the greatest sensitivity possible and the next category which is "high sensitivity". Loch Kanaird was considered so sensitive that a relocation of existing farms was recommended. In other words, the MPA sea lochs are as sensitive a site to wild fish as it is possible to find. Salmon and breeding sea trout are priority marine features.

The Highland Council is clearly concerned about sustainability and managing sea lice too. In it's submission to the ECCLR committee it highlights how difficult it is for planning to control this, especially as monitoring is self reporting, such as seal shooting and lice data which leads to mistrust and difficulty assessing farms with lack of site specific reporting. They noted " unsurprisingly, the issues found in Scotland are comparable to those in Norway!recognition that same issue with same species leads to same impacts...in Scotland! ..This means therefore, there is no good reason to not publicly supply the data we need to better assess the environmental impacts e.g. sea lice data, as per Norway. There is oft-repeated government support for the ever-increasing targets for the salmon industries growth, but this appears to be based on a complete lack of any Sustainability Appraisal, as would be expected for such a topic given the significant environmental impacts and

concerns. It seems to be accepted as fact without any consideration of the impacts (similar to SEPAs approach to DZR changes).

In a publication of Fly Fishing and Fly Tying, polluting salmon farmers were 'named and shamed'. 6 of the 7-8 farms within the Wester Ross Marine Protected area (although it did not exist when the evidence was collected) were noted during Fish Health Inspectorate inspections in 2011 and 2012 as having breached Code of Good practice thresholds of sea lice during the period for which records were inspected. These farms were all near important salmon and sea trout rivers. Ardessie B, Little Loch Broom, Wester Ross Fisheries Limited, Ardessie A, Little Loch Broom, Wester Ross Fisheries Limited, Corry, Loch Broom, Wester Ross Fisheries Limited, Ardessie A, Little Loch Broom, Wester Ross Fisheries Limited, Tanera, near Achiltibuie, Scottish Sea Farms Limited, Ardmair, Wester Ross Fisheries Limited. We believe the restoration of these fisheries would have a much more positive impact than a new salmon farm to the area.

Tourism reliant upon anglers for wild salmon and sea trout have paid the price for the sea lice coming from farms. The following report on the collapse of the Loch Maree sea trout fishery confirms the accuracy of the story attributed to farms in loch Ewe. Most scientists who have studied the data regard sea lice infestations, from salmon farms, as the main reason why the Loch Maree sea trout fishery collapsed in the late 1980s and early 1990s. <https://www.salmon-trout.org/wp-content/uploads/2017/09/Loch-Maree-collapse-A-Walker-report1.pdf> Page 25 and 26 says in conclusion. "Removal of the rearing cages in Loch Ewe is justifiable, even on a precautionary basis. It is highly likely that the introduction of salmon farming in Loch Ewe 1987 was a major cause in the collapse of the sea trout angling fishery in Loch Maree, at the end of the 1980s and that salmon farming is hindering stock recovery, although other factors may be involved which are less, or not, addressable."

Loch Ewe's salmon farms benthic test has been either unsatisfactory or borderline since records began.

SUMMARY

MPAs are Scotland's insurance policy, building resilience into the marine ecosystem so our seas can withstand increasingly unpredictable outcomes from climate change, ocean acidification, plastics, plastic micro-particles and chemical pollution as well as loss of biodiversity from industrial methods of fishing and aquaculture. The network of MPAs, of which Wester Ross MPA is just one, were created to help restore a declining ecosystem. Due to the Umbrella effect, MPAs like Wester Ross protect key nursery and spawning grounds within the richest areas of biodiversity in Scotland which help seed other areas outside the MPA boundary. There is a lot at stake if these are undermined.

We do not need to continue to damage the ecology of our coastline in order to have economic prosperity. Many indigenous Highlanders, and those attracted to living in the area, which support the repopulation of the Highlands, are attracted to work with the sea, and hope to build businesses in the Highlands that can endure. However as ecosystems become more depleted the risk of these jobs being eroded is of concern - and this erosion is often slow, unseen and unrecorded. Economic reports tend to focus on salmon farming benefits and do not account for the many cumulative impacts. This hurts smaller local enterprises or cottage industries which can create just as many jobs. We envisage an alternative economy - for this we need to allow MPAs to recover!

In the attached socio-economic report we have produced an accurate account of the wester ross economy. We hope this research can serve as a first exploration of this alternative economy, and the possibility of the Wester Ross area being a study with relevance to the whole west coast, in which it is a microcosm of a larger picture. We believe a restoration of the sea could produce in the long run even more robust figures if a recovery were supported by Government - and we believe our report challenges the idea that we need more open cage salmon farming.

Sea Change Wester Ross
April 2018

Sea Change Wester Ross Socio-Economic report examining Scottish Sea Farms Developments in Wester Ross MPA as an example of impacts.

Introduction: the SSF Development and the Potential Socio Economic Implications

Whilst there is considerable uncertainty about the environmental consequences of the proposal, no one can argue that further open cage salmon production will enhance the marine environment. Consequently, if we used environmental criteria alone to evaluate the merits of the SSF proposal we would unambiguously reject it. The only remaining doubt would relate to the magnitude of the good fortune in being able to avoid this environmental damage.

Given this, the case for further open cage salmon aquaculture must rest heavily on economic and social criteria. In other words, the consequences for the human population, now and in the future, determine the case for further aquaculture development.

It is therefore incumbent on those advocating the development to demonstrate that the estimated benefits to the human population will outweigh the costs. Moreover, any excess of estimated benefits over costs must be sufficient to swamp the inevitable uncertainty about predicting the relative magnitudes of these gains and losses.

Clearly, a failure to ensure that costs and benefits to the human population are properly considered could lead to policy failure reflected in inappropriate levels of salmon aquaculture.

An Overview of the Economic Benefits from Salmon Aquaculture

In contrast to the economic costs, the economic benefits are relatively straightforward. There are two primary benefits. These are employment generation, measured in Full Time Equivalents (FTEs), and increases in household income in the form of additional wages, salaries, rents and profits. The sum of these sources of income are termed Gross Value Added (GVA).

The contribution of salmon aquaculture to the Scottish Economy is significant. In 2014, the Imani Report (2014)¹ provided extensive evidence of the contribution of salmon production.

Using Scottish Salmon Producers Organisation (SPPO) data the Imani Report estimated member employment of 2,200. This was much higher than the equivalent Scottish Government figure of 1,059 for direct salmon employment for the same year. This is largely because Imani includes smolt production, marketing, logistics, management and other staff.

In the Imani Report, salaries were estimated to be between 10 and 15% of total turnover and GVA between 20% and 30% of turnover. It is worth noting that if GVA is 20 to 30% of turnover and wages and salaries are 10 to 15% of turnover, we can presume wages are 50% of GVA. If production companies are foreign owned, the 50% of GVA in the form of profits will largely be repatriated.

This Imani Report went beyond simply the direct FTEs and direct GVA in salmon production. It considered the possibility of indirect FTEs and GVA. Salmon production supports further **indirect jobs** in the “value chain”. These include suppliers of equipment, transport, feed and

¹ An Assessment of the Benefits to Scotland of Aquaculture April 2014

husbandry inputs including bio-tech vaccine and de-licing supply, downstream fish processing jobs, retail and catering sales in Scotland of fish produced in Scotland and organisations involved in research and innovation. These upstream and downstream activities are dependent on salmon production and, if production ceased, employment and GVA in these dependent activities would diminish accordingly.

This is a legitimate and important argument. If salmon production disappeared, many upstream and downstream businesses would be devastated. However, the impact on will be varied. For example, large salmon processing business will suffer, but to some extent, they might be able to substitute using imported raw materials. Similarly, transport companies might be able to find new customers. The Imani study estimated the number of indirect jobs and argued that all were 100% dependent on salmon production. This was because the final product was sold on its "Scottishness" and the raw material was therefore not substitutable.

This 100 percent argument seems unlikely.

The Imani report stated that, in addition to these direct and indirect jobs, **induced impacts** are also relevant. A local barber or butcher will benefit from the spending of those whose jobs are directly or indirectly dependant on salmon production. This is the induced impact. It is worth noting that clothing manufacturers in Asia and cheese producers in England also benefit from the induced impact.

Below are the main conclusion of the Imani Report along with some qualifying discussion:

- **Total revenue for aquaculture production in 2012, was £537m for salmon production. GVA (primarily salaries and profit) was 30% of revenue.**

Presumably GVA is £165.8m and half of this (say £83m) will be wages and salaries. Much of the salmon profits will be repatriated to Norway and elsewhere.

- **Direct jobs in farm production, including ancillary staff, was an estimated 800 jobs.**

This implies a mean turnover per employee of £196,000 and an implied mean wage of £29,600. This seems reasonable. Elsewhere the Imani Report (p.39) states "*The SSPO data shows a member employment figure of 2,200 (this is higher than the Scottish Government figure of 1,059 for salmon employment because it includes smolt production, marketing, logistics, management and other staff, not just farm-based workers) and a total 'economic contribution' of gross pay of nearly £62m. We consider this to be a fairer reckoning and is based on primary industry data.*"

- **Within the whole Scottish supply chain, Scottish aquaculture sites generate over 4,800 jobs and £270m of GVA across all farm production all suppliers, processing and into retail.**

This implies there are around 2,000 indirect Scottish jobs and £104m of indirect Scottish GVA. This seems a modest indirect total, but the actual calculations are not available for checking. Based on the information provided, the direct and indirect total should be **4245**, not 4,800.

- **Taking into account the induced effect (an implied additional 3,200 jobs) Scottish aquaculture is estimated to deliver 8,000 jobs to Scotland, (and 8,800 jobs to the whole UK).**

Importantly this implies the induced effect creates 3,200 Scottish jobs. The induced effect is subject to many hidden assumptions. Indeed, the £270m of direct and indirect GVA ie (wages, rents and profits) is going to work hard to generate 3,200 induced jobs. Only about

50% of this will be wages and salaries (£135m), the rest is largely repatriated profits. Of this £135m, a proportion will be taken in tax, (say 40% including VAT). Some of the remaining £81m will be saved for a rainy day. A proportion of the £81m will be spent, via the internet, on goods from outside Scotland, or on travel and leisure outside Scotland and therefore have no Scottish impact. Potentially, the remaining amount might be spent within Scotland and this is highly desirable.

An optimistic proposition is that about £60m of direct and indirect GVA will be spent in Scotland. However, some of the products purchased in Scotland will have a high import content and hence very low Scottish GVA contribution. For example, petrol, tobacco etc may only contribute 5 to 10% of their retail price to Scottish GVA in the form of the retail margin.

Thus after paying for their imported supplies Scottish businesses receiving the direct and indirect GVA might have a very generous 30% of the £60m (ie £20m) left to pay wages rents and profits. Of this £20m, for illustrative purposes, we might assume that a very generous £15m is paid in wages within Scotland. The £270m of direct and indirect GVA in the Imani Report has dwindled to £15m, which is supposed to be capable of supporting another 3,200 induced jobs, implying an average wage per FTE of £4,700. There is undoubtedly an induced effect, but on the information in the MS Report, it appears to have been overestimated and this somewhat undermines its credibility.

Kenyon and Davies (2018), using Marine Scotland's Scottish Fish Farms Production Survey (2016), reported that Scotland produced 162,817 tonnes (£765m by value) in 2016 and **directly employed** 294 staff in smolt production and 1,486 in fish production. This total employment of **1780** was mainly in the Highlands and Islands. Kenyon and Davies study did not estimate the indirect and induced impacts.

In **2017, Imani and Westbrook** produced a report for Highland and Island Enterprise on the value of aquaculture to Scotland. This report built on and updated the economic analysis undertaken in the 2014 Imani report. This was a much more detailed and convincing analysis and provides more robust estimates that can inform resource allocation decisions

Imani and Westbrook (2107) using the 2015 Marine Scotland Finfish Production survey report which provided the following production and value data.

	Tonnage	Value (£m)	Value per Tonne (£) 2015 prices
2009	144,247	459,716	3,187
2011	158,018	622,274	3,938
2013	163,234	691,949	4,239
2015	171,722	637,089	3,710

Scottish salmon production is concentrated in five largest producers (see Table Below) Three of the five large firms (Marine Harvest, Scottish Sea Farms and Grieg Seafood) are Norwegian owned, the Scottish Salmon Company Ltd is registered in Scotland (with parent company listed the Norwegian Stock

	Tonnes (GWE)
Marine Harvest	50,100
Scottish Sea Farms	27,000
The Scottish Salmon Co.	25,600
Cooke Aquaculture	19,000
Grieg Seafood	16,400
<i>Top 5 Producers</i>	<i>138,100</i>

its
on

Exchange). Cooke Aquaculture is North American.

With respect to direct employment, Imani and Westbrook provided the following:

Table Direct Employment

	2014	2015	Average
Salmon harvested (tonnes)	179,022	171,722	175,372
FTE employment	1,258	1,310	1,284
No. of smolts produced (000s)	45,004	44,571	44,788
FTE employment	277	267	272
Total	1,535	1,577	1,556

Later in their Table 30 we are informed that if management and admin staff are included, direct employment in salmon and smolt production is **1,788**.

Salmon Production (Direct effect)	FTEs	Earnings (£m)
Smolt & salmon production	1,555	46
Management & administration	233	8.1
Total	1,788	54.1

With respect to indirect employment, Table 30 provides the following

Salmon Inputs	FTEs	Earnings (£m)
Fish feed supply (incl indirect)	416	10.2
Transport (incl indirect)	534	16.0
Vet services and medications (incl indirect)	596	23.1
Capital investment (incl indirect)	486	14.6
Other purchases by salmon farming businesses	1,530	42.5
Total	3,562	106.4

With respect to indirect processing employment. Table 30 provides the following

Processing	FTEs	Earnings (£m)
Processing (primary plus secondary) direct	2,854	64.2
Processing indirect	285	7.1
Transport post processing (incl indirect)	200	6
Total	3,339	77.3

Imani and Westbrook provided information on the geographical distribution of processing employment

Region	2008	2010	2012	2014
Grampian & Highlands and Islands	2,168	1,591	1,078	1,555
Other Scotland	1,839	2,155	1,921	1,996
Rest of the UK	674	476	628	1,096
Total	4,681	4,222	3,627	4,648

Seafish provided unpublished data on Highlands and Islands. There were 878 FTEs in salmon processing in its Highlands operations in 2014. Scottish processors employ a significant proportion of migrants from other EU countries. This means that some of these earnings are repatriated and will reduce the impact of the induced effect. Processing FTEs have tended to move away from Grampian and the Highlands and Islands.

Finally, we have induced employment estimates as follows:

	FTEs	Earnings (£m)
Induced employment	1,651	33.0

This is a more realistic estimate than Imani (2014). The Table below combines the direct, indirect and induced elements.

	FTEs	%	Earnings (£m)
Salmon Production (Direct effect)	1,788	17%	54.1
Indirect Effect (Inputs)	3,562	34%	106.4
Indirect Effect (Processing)	3,339	32%	77.3
Induced Effect	1,651	16%	33.0
Total	10,340	100%	270.8

Finally, Imani and Westbrook provide an estimate of £540 for GVA, which in keeping with Imani (2014), is twice the earnings of £270.8m. Thus, GVA is split equally between earnings and profits, the latter will be mostly repatriated.

The above Table enables the confirmation of a number of features of salmon aquaculture in 2015.

- Farm production sales were £637m.
- Of this £637m of sales, £54.1m was spent on earnings in production supporting 1,788 jobs.
- Of the (unknown) amount spent on inputs, £106.4m supported upstream employment of 3,562. It is assumed that all these jobs will disappear if Scottish salmon production ceased.
- Processing earnings were £77.3m supporting 3,339 jobs. These jobs do not depend on the revenue earned by farm production. These jobs are financially dependent on those selling the processed fish. If Scottish salmon is not substitutable, it is legitimate to assume that all these jobs would disappear if salmon production ceased in Scotland. On the other hand, if a proportion could be substituted by imported supplies or other raw materials, it would be misleading to suggest that 3,339 processing jobs are 100% dependent on Scottish farm production. It must surely be true that the processors could process at least some other fish from other sources if no Scottish salmon was available.
- Induced earnings were £33m supporting employment of 1,651 in activities unrelated to salmon production or processing . 38% of these induced jobs were dependent on processing activity therefore not in the areas where the fish production takes place. If some Scottish salmon can be substituted it would be misleading to assign all the induced employment to salmon farming.

The employment estimates are significantly greater than Imani (2014). However, they are buttressed with significantly greater insights and data on the upstream and downstream linkages. There is probably an element of over estimation, because of the assumptions relating to substitutability and the 100% dependency of upstream jobs on salmon production. Despite this, as a generalisation it is probably appropriate to state that each production job creates supports five other jobs in Scotland. Few of them are in the areas where the environmental costs of that production are felt.

The 10,300 jobs direct, indirect and induced FTE jobs and £270 of earnings represents a good first approximation to the benefit to Scottish Economy.

The Economic Benefits to Scotland and Wester Ross

It is often assumed that many of the benefits of fish farms are felt by the closest communities. As a case study, we have assessed this by considering the economic benefits of the proposal by Scottish Salmon Farms Ltd, to add a 2000 Tonne farms in Wester Ross and expand an existing one. Local knowledge suggests that a new farm of this size is likely to

scotdz:S01003933	R&C South West	scotdz:S01003955	R&C North West
scotdz:S01003946	R&C South West	scotdz:S01003956	R&C North West
scotdz:S01003948	R&C North West	scotdz:S01003963	R&C North West
scotdz:S01003953	R&C North West		

produce between 3 and 5 FTE direct fish farm jobs. For the purpose of this document, the

Wester Ross economy is defined by the seven Office of National Statistics (ONS) data-zones that adjoin the Wester Ross Marine Protection Area as shown in Fig 1 and Table 1. There are other ways in which the local economy could be delimited, but these would not fundamentally alter the main conclusions.

Fig 1 Area Map

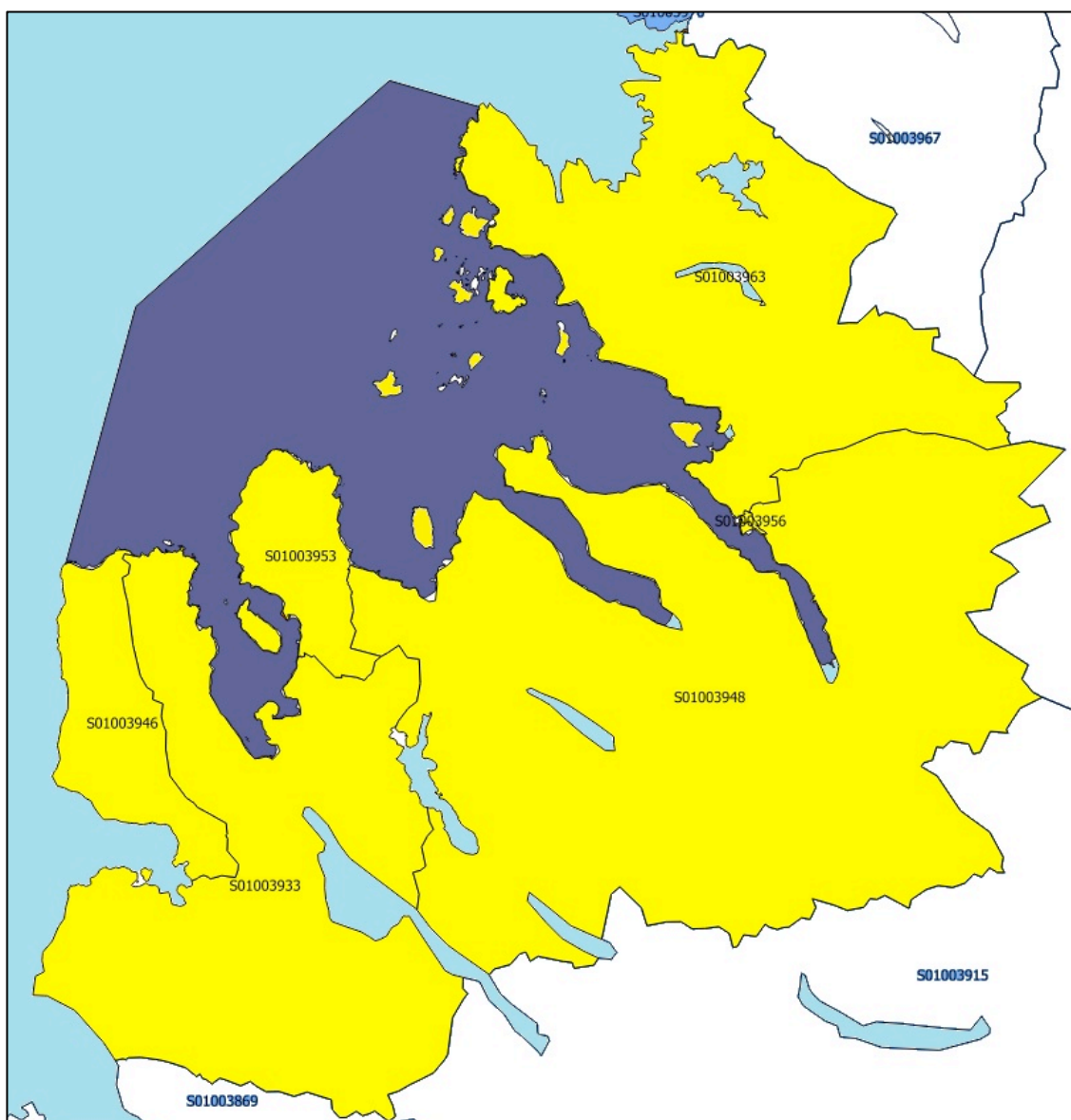


Table 1 ONS Ross and Cromarty data-zones adjoining Wester Ross MPA

The population of this area is 4521 of which 58% (2623) are of working age. The average household size in Scotland is 2.27 and this would imply 1,990 households in the area. (Census 2011)

The Employment Survey produces information by data-zone with different levels of sector disaggregation (but does not record agriculture).

Table Employment by Sector

Sector	Employment
Sea Fishing	29
Aquaculture	100
Marine Transport	27
Accom ,Food,Drink	466
Recreation	110
Construction	89
Retail&Wholesale	186
Transport	61
Public Services	499
Other Services	113
Total	1680

Of the 940 of working age not recorded in the employment survey, some will work in agriculture and a substantial number will work part-time, unrecorded, in tourism, in home B&Bs and in cleaning on an irregular basis.

The Economic Benefits of the SSF proposal are relatively straightforward.Using the ratios implied in the Tables the benefits to Scotland are presented below for the anticipated 3 and 5 FTE direct jobs will be created.

Benefits to Scotland of 3 Production Jobs

	FTEs	Earnings	GVA
Salmon Production (Direct effect)	3	£90,772	£181,544
Indirect Effect (Inputs)	6	£178,523	£357,047
Indirect Effect (Processing)	5.6	£129,698	£259,396
Induced Effect	2.8	£55,369	£110,738
Total	14.3	£454,362	£908,725

Benefits to Scotland of 5 Production Jobs

	FTEs	Earnings	GVA
Salmon Production (Direct effect)	5.0	£151,286	£302,573
Indirect Effect (Inputs)	10.0	£297,539	£595,078
Indirect Effect (Processing)	9.3	£216,163	£432,327
Induced Effect	4.6	£92,282	£184,564
Total	28.9	£757,271	£1,514,541

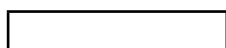
In reality, the GVA column could be ignored because half of this is profits which are largely repatriated.

With respect to the Wester Ross economy, the direct effect will create between 3 and 5 jobs. Most of the indirect jobs associated with inputs will by-pass the local economy. For example, feed is the most expensive input and this will be sourced outside this area, much of it outside Scotland. Some transport and vet services might benefit from the increased production. Some of the indirect jobs associated with inputs will be connected with the local economy, particularly smolt production. We will assume that a generous 20% of inputs are sourced locally. The processing element will be undertaken outside Wester Ross.

The induced effect is unlikely to be strong. Some of the earnings of the 3-5 local direct jobs and the 0.6-1.0 supply jobs will be spent locally. These total earnings would be between £96,746 and £181,157. After all taxation, about 60% could be spent locally. However, the local economy is very small and most goods will be sourced outside Wester Ross, often directly via the Internet. Apart from the retail margin, housing rents and some locally produced food, most of the spend will flow out of the region. We will assume a generous 15% remains in the local economy.

Benefits to Wester Ross of 3 Production Jobs

	FTEs	Earnings
Salmon Production (Direct effect)	3.0	£90,772
Indirect Effect (Inputs)	0.6	£5974
Indirect Effect (Processing)	N.A.	N.A.
Induced Effect	0.7	£14,512
Total	4.3	£111,258



Benefits to Wester Ross of 5 Production Jobs

	FTEs	Earnings
Salmon Production (Direct effect)	5.0	£151,286
Indirect Effect (Inputs)	1.0	£29,871
Indirect Effect (Processing)	N.A.	N.A.
Induced Effect	1.4	£27,174
Total	7.4	£208,331

In the context of the Wester Ross economy, an annual injection of £200k is indeed useful. The industry would, with some justification, also emphasise that the jobs on-farm created are demanding, high value and well paid and require a balance of intellect and husbandry which the industry supports with on-going training. The industry would argue that its activity enables the community to retain highly effective and capable people who, in turn, can use their abilities to enhance & develop the local community. In reality increasing mechanisation reduces this over time.

A Cautionary Note on Economic Benefits

Some caution needs to be exercised in using these data to advocate for further expansion. With respect to employment creation. One obvious consideration is that, if there were labour shortages then the industry is simply diverting labour with no net reduction in Scottish unemployment. Indeed processing companies now need to recruit staff from other EU countries. Thus changes in salmon production has an impact on net migration, and not just unemployment levels. At a more localised level, some businesses in remote areas, such as Wester Ross have had recruitment difficulties if significant salmon aquaculture operations are extended. However inward migration to rural areas like Wester Ross is a good thing.

It is important to appreciate that, just because an industry is large and making an economic contribution, it does not mean that we should devote more resources to it. The case for expansion has to focus on the additional benefits and costs that the expansion will deliver. In that context, we should appreciate that the averages presented above reflect current level of resource use. Unless all the underlying relationships are linear and have a zero origin, these current levels are not necessarily reliable guides when used to advocate a change in resource use

In the real world, relationships are not linear. Consequently, the averages calculated using current levels of exploitation will differ from post expansion (or contraction) average values. For example, a general presumption is that, as a society, when we produce more of something each additional unit becomes less valuable. Whilst, each additional tonne of salmon is less valuable than the previous, this decline might not be quantifiable for an individual project, such as the SSF Wester Ross development. The problem is that, if we uncritically use current averages to approve all current proposals, the collective impact means the actual economic benefits will be less than expected. For example, the VALUE OF AQUACULTURE TO SCOTLAND report (HIE June 2017) says that the high cost of making much larger fish farms offshore, under the new DZR scheme advocated by SEPA, will result in substantially fewer jobs per farm because, "producing twice as much salmon in the average year from a new site than from an existing site would require much lower than proportionate site staffing (with automatic feeding), and also with logistical economies in feed supply and transportation from sites for harvesting".

At the same time, there is also a general presumption that when we have less of something, the remaining units become more valuable. Thus, as marine biomass and diversity declines, the remaining units become more valuable and worthy of greater protection. If all salmon farm proposals are evaluated using current values the eventual economic costs could be significantly greater than expected.

There is therefore an inherent bias when deciding whether to expand salmon aquaculture. This is because, using current averages we are inclined simultaneously to overestimate benefits of more salmon production and to underestimate the environmental costs.

An added and very important complication is that environmental damage costs are much more difficult to calculate. This is because the true extent of the physical damage to the marine environment remains uncertain. Even if we fully understood the environmental damage, its consequential impacts on human welfare are very complex and less readily quantified by economic analysis. We believe that the decision process regarding salmon farm expansion downplays the highly significant economic costs due to environmental degradation, in favour of more readily quantifiable economic benefits.

The inherent bias and the difficulty in estimate the economic value of environmental damage costs are not trivial issues, especially given Scottish Government policy on aquaculture and the amount of proposals coming forward.

The Economic Costs to Wester Ross

These costs are the adverse consequences of salmon production for members of the human population. Put simply, an economic cost has been imposed, if people judge themselves to be worse off. Individuals might be worse off for diverse reasons. This might be because of income and employment loss, deterioration the quality of their recreational / leisure activity, or psychic income loss to quality of life because of environmental degradation

If salmon aquaculture, directly or indirectly, prevents other businesses from exploiting the marine environment then the salmon aquaculture industry is generating costs. Consequently, from the perspective of Wester Ross, if salmon aquaculture is compromising fishing businesses such as creeling or scallop diving or business supplying services to tourism such as wildlife tourism, recreational sea angling, recreational diving, kayaking, birdwatching then the net contribution in FTE's and GVA could be negative.

This discussion focuses on the impact of the development on the following sectors

- 1) Commercial Shellfisheries
- 2) Recreational Sea Angling and Diving
- 3) Tourism

In the attached Sea Change Wester Ross overview we have explained the potential damage caused by open cage salmon aquaculture. There are a number of mechanism whereby salmon production can impact on the above sectors. As an aide memoir, and to provide a framework for the discussion, we have presented tables below which summarise the mechanisms whereby salmon farming is imposing costs on the human population

1) Impact On Commercial Shellfisheries

It is clear that sea fishing employment has not been fully identified in the Employment Survey quoted above. Fishery Statistics state that there were 124 Full Time and 36 Part-Time jobs in the Ullapool District ie around 142 FTEs. However, only a fraction of these will be fishing inshore. There are 49 vessels registered in Ullapool. Using local knowledge, we identified:

- 23 vessels using creels and pots for Nephrops, lobster and crabs,
- 3 dive vessels targeting scallops,
- 1 sea safari vessel in the Summer Isles and many more using the MPA area
- 7 trawlers fishing locally
- 3 vessels were unknown or operated as a hobby.
- Unusually there were 12 Scottish registered Spanish boats employing Spanish crews fishing west of Rockall and NW of Shetland.

Collectively, these fishing vessels support 4 local full-time and 3 local part-time jobs plus jobs supported locally through fuel and stores, though not chandlery.

The Coigach creel fishermen have expressed opposition at the Coigach Community Council to SSF's proposal for; a large new salmon farm at Horse Island, expansion of the current farms at Tanera Eas and replacement of the 3 smaller sites and another farm in scoping at Bottle Island. These developments are situated at the heart of Wester Ross MPA which was designated to protect the unusually important biodiversity, and maerl beds and flame shells in particular, both of which are Scottish Government Priority Marine Features and especially vulnerable to impact by fish farm waste

	Creeling (Nephrops)	Creeling (Crabs and Lobster)	Scallops Hand Diving
Loss of fishing ground	(1) Direct Impact	(2) Probably No	(3) No Impact
Chemical Use	(4) Some Impact	(5) Some Impact	(6) Some Impact
Sediment	(7) Some impact	(8) Some Impact	(9) Some Impact
Waste Nutrients	(10) Some impact	(11) Some Impact	(12) Some Impact
Loss of Maerl	(13) No Impact	(14) No Impact	(15) Some impact

Notes

1)	There will be a direct effect. As stated previously the proposed farms in scoping will utilise 101 hectares of seabed.
2)	Very small effect
3)	Cages are sited in a water that is too deep for divers.
4) 5) 6)	Chemical use will have a direct effect in the vicinity. Emamectin benzoate is a toxic vector correlated with a mean drop in crustacean numbers and abundance of about 60% on crustaceans outside the Allowable Zone of Effect SARF098 'PAMP2' study.
7) 8) 9)	Sediment smothering covering the area beyond the Allowable Zone of Effect
10) 11) 12)	Extra nutrients fostering algae blooms and dioxins making shellfish dangerous for human consumption. Serious risk of reputational damage to Scottish shellfish sector.
15)	Maerl is an important habitat for scallops to settle and grow

Discussion

The proposed farms (currently at the scoping stage) would utilise 101 hectares of sea bed, This is equivalent to 100 rugby pitches

Site	Area (hectares)
Tanera	32.5496
Horse Island	35.4850
Bottle Island	33.1500
Total	101.185

The Scottish Creel Fishermen's Federation have highlighted concerns about the cumulative impacts of several farms in inshore areas and the impact of biomass and accumulation of waste. In written evidence to ECCLR they state that according to a review by commissioned SEPA and undertaken by the Water Research Centre, application of emamectin benzoate on Scottish farms has increased significantly. The increase between 2002 and 2015 saw salmon output double, whereas the mass of emamectin benzoate in the marine environment increased six-fold. They are concerned about the impact of this on prawns, lobster and crabs and state the long-term effects of neurotoxin pesticides on scallops and mussels remain ill defined. Scallop stocks appear to be declining in areas with salmon farms. They also have serious concerns that studies in Chile show that anti sea lice formulations have significant impacts on target crab (*Metocarcinus edwardii*). on the impact of anti sea lice formulations on target crab (*metocarcinus edwardii*). They consider there is too little independent research on bio-accumulation and on the longer term effects on inshore water ecosystems.

We had a response from 9 creel vessels whose fishing effort was close to the proposed sites. There were 3 other vessels that fish in the vicinity for which information was not available. These 9 known vessels collectively deployed 8,580 creels annually in the area around the summer isles. Each creel lands on average 5.5kg of live *Nephrops* which sell on average for £9.88 per kilo. This means as a group these vessels have a revenue of £470k. There is also an important crab fishery with four different vessels using about 950 creels.

Of the 8,580 *Nephrop* creels, 1,480 creels are deployed directly where the development is proposed on the Horse and Tanera sites. These creels on average would generate a revenue of £81K per year. The remaining creel capacity could also potentially be affected through the reasons outlined in the Table above. It is difficult to estimate the number of jobs that might be lost. The 9 or so creel vessels represent about 14 FTE's in direct employment. This is a considerable number for the Wester Ross economy. It is inconceivable that, by itself, the SSF development result in all these being lost. At the same time, there considerable anxiety among creel fishermen and it would be wrong to disregard their views. Just as a loss of 14FTE's is not credible, neither is a zero loss. A loss of 2 to 3 FTE's is the least bad estimate.

It is quite certain that the shellfish fishery will be worse off and these fishermen believe they will face increased commercial risk. Two creeling vessels will be directly affected and there are indirect effects of unknown magnitude causing real concern for at least 7 other vessels targeting *Nephrops*, Crabs, lobster and hand diving for scallops.

2) Impact on Recreational Angling and Diving

At one time, this area had an enviable reputation for **sea angling**. Tourist visitors came from all over the UK and as far as mainland Europe specifically to participate in sea angling for sea trout and salmon and other species too. Before 1984, there were at least 6-7 angling charter vessels between Ullapool and Coigach. Tragically, recreational river and sea angling catches and therefore visitor angler numbers are now a fraction of historic level. Indeed,

visitors participating in sea angling regularly express disappointment about the losses. We have now reached the situation where local sea angling competitions and fish festivals are no longer key attractions or have ceased altogether. For example, a recent sea angling competition resulted in one herring being caught. (Herring tend to spawn on maerl and this will have an impact - although dredge impacts have been more significant)

There are times in the year when the prawns are 'off', generally around May/June/July (but not predictably). In the past, this down time was used to carry out boat maintenance and Fishermen could offer sea angling for Tourists with a clean and painted boat. This gave a continued income to the creel boats and provided a break for the prawn stocks. Now offering sea angling is not viable due to the lack of fin fish. Whilst not attributed to salmon farming alone - it does have an additional impact on the local economy as now when the prawns are 'Off' so are the fishermen. A fin fish recovery could support the local fishermen in this way too. Species like maerl, flame shells and sea grass are impacted by salmon farms and are an important part of this recovery.

Salmon and sea trout fisheries used to attract many visiting anglers who would spend large sums renting fishing and accommodation. Radford *et al* (2004)² examined the contribution of game and coarse angling to the Scottish economy. They estimated that game and course angling supported 2,800 Scottish jobs with salmon and sea trout supporting 2,200 of these jobs. Moreover, salmon and sea trout angling have been making this contribution for over a century. Radford *et al* estimated that in the Highland Region salmon and sea trout angling supported 781 jobs.

Locally, the Loch Maree hotel was one of the most famous sea trout systems in Scotland, and regularly fished for sea trout and salmon. In the 1970's and 1980's the hotel itself boasted nine ghillies through the fishing season.

	Recreational Sea Angling and Diving	Salmon and Sea Trout Angling
Loss of ground	(1) Minor impact	(2) No Impact
Chemical Use	(3) Indirect Impact	(4) Indirect Impact
Sediment	(5) Indirect Impact	(6) Indirect Impact
Waste Nutrients	(7) Indirect Impact	(8) Indirect Impact
Escapees	(9) No Impact	(10) Significant
Loss of Maerl	(11) Indirect Impact	(12) No
Sea Lice	(13) No	(14) Significant

3) to 8)	The impact on biodiversity and biomass will adversely affect the quality of recreational sea angling and diving. Salmon and sea trout populations are adversely affected, most likely through sea lice. Habitats which support fisheries are too.
10)	Escapees are a very serious issue

² The Economic Impact of Game and Coarse Fishing in Scotland. Radford, A. Riddington, G, Anderson, J. and Gibson, H. Prepared for Scottish Executive Environmental and Rural Affairs Department (2004)

11)	Maerl is thought to support herring spawn. There had been recent reports and video footage by scallop divers of a large 2km x 1km spawning ground for Winter Spawning Herring on maerl beds just south of the MPA in the Wester Ross economic zone near Gairloch . Herring recovery would be beneficial
14)	Considerable evidence exists about a link between farm-intensive areas and the spread of salmon lice to wild Atlantic salmon and sea trout. Several studies have shown that the effects of sea lice from fish farms on wild salmon and sea trout populations can be severe; ultimately reducing the number of adult fish due to salmon lice induced mortality, resulting in reduced stocks and reduced opportunities for fisheries. Depending on the population size, elevated salmon lice levels can also result in too few spawners to reach conservation limits

With respect to recreational **sea angling** in the North West Inshore Fisheries Group FG area Riddington and Radford (RR, 2015) estimated that if the decline in recreational sea angling (RSA) continued, round 80 FTEs jobs would be lost. On the other hand, a 25 % improvement in sea angling would create around FTE 20 jobs.

The benefits to the Wester Ross economy will be a proportion of the IFG area benefits. The population of the IFG area was estimated by R and R (2015) to be 40,859. On that basis, the population (4,521) of the local Wester Ross economy, would account for 11% of the IFG area. If sea angling continued to decline we could lose 8.9 jobs

. If the SSF proposal were to contribute to further declines in sea angling we could lose 8.9 direct, indirect and induced jobs.

With respect to salmon and sea trout, it is interesting to note that Radford et al estimated that each salmon and sea trout angling day resulted in spending of £290 (at 2018 prices) of which £168 became household income. Thus, 1,190 additional salmon and sea trout angler days would generate as much local income as the SSF proposal. . The £200,000 of visiting angler spending could support as many as the 7.4 direct, indirect and induced jobs implied by the SSF proposal. A loss of 1,190 salmon and sea trout angler days could cost the area 7 jobs.

The table below combines the potential consequences for all recreational fishing and illustrates the order of magnitude of the potential job loss.

Table indicative Costs (Wester Ross Economy)

	FTE Loss with continued decline
Recreational Sea Angling	8
Salmon and Sea Trout Angling	7

Elsewhere in Scotland, recreational sea angling (in Dumfries and Galloway), recreational diving (Orkney) salmon and sea trout angling (East and North Coast) make highly significant

contributions to the local economy. Locally, this contribution is understood and efforts are made to protect and where possible enhance the recreational experience for both residents and visitor. It is regrettable, that in Wester Ross changes in the marine environment have reduced the quality of the recreational experience for all visiting anglers and divers. The economic costs in terms of income and employment have been significant.

Additional open cage salmon farming simply adds to the burden and further constrains the areas capacity to exploit the enormous potential of its sea angling, salmon and sea trout angling and recreational diving.

These foregone economic benefits in the form of GVA and FTEs from supplying angling and diving services are an enormous cost, which in some significant degree are attributable to local salmon production.

3. Impact on Tourism

Tourism is an extremely difficult industry to define and measure. The traditional sectors of Accommodation and Food & Drink only tell half the story in an area where a very large proportion of the tourists are in self-catering accommodation, which may well be owned by them or their friends. Many locals own two or more properties, one their residence the other(s) rented to visitors

Of the other sectors a high percentage of construction activity will be linked to tourist accommodation, both new construction and maintenance. Almost all transport is tourist (if not holidaymaker) related; and retail/wholesale provides directly to self-caterers. Meanwhile the vast majority of both public and private services go to supporting those providing services for tourists. Employment survey statistics show that Tourism can be specifically identified as 34% of the economy but arguably provides the foundation for 80% of employment in the area. Tourism and visitors are the economic bedrock of Wester Ross.

Tourism and Local Marine Environmental Service Flows

Local providers of accommodation report that tourists predominantly come from North England and Southern Scotland, followed by the southern parts of England and European countries such as Germany, Austria, and Switzerland. They also believe that tourists come to this area primarily for the peace and quiet, the stunning topography and the flora and fauna. Visit Scotland's latest survey (2015-16) shows that visitors gave Scotland's landscape as their primary reason for visiting. Tourism is worth about £11bn to Scotland, rising to c.£23bn by 2025.

Whilst some tourists, say on motoring the NC500 or on coach trips, engage informally and more passively with the natural environment, a significant proportion seek more active engagement through walking, climbing, camping, marine safaris, ornithology, yachting, and kayaking.

The marine environment is very important for some tourists, especially marine ornithologists and participants in marine ecotourism and safaris. In addition, since most settlements are on the coast, the marine backdrop is used to market visitor accommodation.

There is a growing trend in marine tourists arriving by sea by sail or motor boat. Across Scotland, there are increasing amounts of marine tourism and the provision of shore side berthing and facilities is improving.

	Casual Visitor (walking, photography)	Sea Safaris focused on sea mammals and bird life	Recreational Boating (e.g. sailing and kayaking)
Visual Impact	1) Impact	2) Strong Impact	3) Impact
Reduced Biodiversity	4) Impact	5) Impact	6) Impact
Acoustic Deterrent Devices (if used)	7) Impact	8) Impact	9) Impact

Notes on Cells

1) 2) 3)	Salmon farms have serious impacts on tourism. Cages are visible from the shore line degrading the views which attract visitors. One report said 50% of visitors felt it mattered. Details below.
2)	There are 4 or 5 vessels in the area taking visitors to sea. The viewing of marine mammals is, to a varying degree, a key part of the boating experience. All the Summer Isles are known for having seal haulouts and pupping areas. Bottle Island has a small sheltered bay between Carn Lar and Carn Deas that is the pupping and nursery area. The proposed farm lies close to the nursery area. On Horse Island, the proposed farm is very close to two seal haulouts. Those involved with tourist trips would question the merit of developing a fish farm in the middle of seal habitat, especially as there is consultation for a Wester Ross and the Minch protected area for Harbour Seals. Seals are shot by fish farmers under licence from SNH.
4) 5) 6)	The area sells itself on the marine environment, topography and remoteness. Visitors expectations, particularly about marine biodiversity and biomass may not be fully realised
7) 8) 9)	Acoustic Deterrent Devices are used to scare off salmon predators such as seals. Dolphins and whales are very sensitive to these devices and this sensitivity may extend as far as 14km.

Nimmo & Cappell (2011) (Assessment of evidence that fish farming impacts on tourism. SARF045, in Aquaculture Research) found that 25% of the visitors they questioned did not want to see an increase in the number of fish farms, over a third didn't want to see them get any bigger & 10% said they would be less likely to visit these locations. 48% said the expansion of fish farming would negatively impact the scenery and 46% said it would negatively impact the natural environment. They included fish farm workers in their survey but only one person who was using the water recreationally.

In the past, a key tourist attraction was fresh seafood, caught locally and served from sea to plate, or bought by self-caterers directly from fishermen. The area now imports finfish and visitors are very surprised they can no longer source a broad range of sustainable local caught finfish products, or even rely on catching their own. The inshore marine environment on the West coast has reached the state where not a single vessel can make a living targeting demersal fish. Regrettably, there are concerns about the trends in the abundance of marine birdlife.

The reality of our local marine biodiversity and biomass could therefore be quite different from what our visitors are led to believe. In some respects, we could be guilty of marketing the area on false pretences.

The local view is that, because of the diminished flow of local marine environmental services, our visitors are now less likely to return, to recommend the area or to report positively on social media. Trends show testimonies on social media are particularly

powerful. Given the reach and effectiveness of social media, the on-going risk to the area's reputation and its tourist numbers is a matter of very real concern.

The massive importance of tourism to the local economy means that any contraction in tourist numbers threatens to undermine the economic development of the entire area and the sustainability of population levels.

Increased salmon production means that marine environmental services will continue to decline with commensurate damage to the area's reputation and adverse impacts on the tourist economy. The current priority must therefore be to arrest the decline and maintain the area's reputation as a place for visitors to enjoy the marine and coastal activity.

Clearly, the health of the tourist economy is absolutely crucial to the long term health of the entire local economy and the sustainability of its resident population. It is our view that the tourism sector needs protection and enhancement.

Additional open cage salmon farming will adversely affect the local marine environment and therefor limit our capacity to attract and retain our visitors. This means that because of salmon farm production we have less GVA and fewer FTEs in businesses serving the tourist sector. These foregone benefits are a cost attributable to local salmon production. For example, it is reasonable to suggest that a very modest 2.5% increase in tourism could deliver at least 25 full time equivalents (FTEs).

The corollary of this is that a similar decrease could cost 25 (FTEs). If the tourism industry were to undergo significant downward adjustment one could expect, over the longer term, commensurate falls in the number of permanent residents

Conclusion

The SSF proposal will generate between 4.3 and 7.4 direct, indirect and induced jobs in the local area we have studied. These jobs and possibly £200,000 in local income are the benefits of the proposal.

This additional open cage salmon production will have adverse consequences for the marine environment.

As a consequence, a number of activities will, to a greater or lesser extent, be worse off, including:

- Creeling for Nephrops, lobsters and crabs
- Hand diving for scallops
- Recreational Sea Angling
- Recreational Diving
- Salmon and sea trout angling
- Casual Visitors
- Sea safaris
- Recreational Boating

In some instances, as discussed above, there is secondary data which allows us to speculate about the number of jobs at risk. This is summarised in the table below

Sector	Jobs at Some Risk
Creeling for Nephrops, lobsters and crabs	2-3

Recreational Sea Angling	8
Salmon and Sea Trout Angling	7
Tourism	25
Total	42-43

We are confident that the above sectors will be worse off. There will therefore be, as yet unknown, job and income losses. We have little confidence in the exact numbers, but it is entirely possible that the income and employment benefits we would save by preventing further damage to the marine environment are likely to exceed the benefits from further farmed salmon production.

This is an important point. We readily accept that we cannot claim unambiguously that the job losses will exceed the gains. It similarly follows that those who advocate the development cannot rest their case on the claim the proposal will result in a net expansion of income and employment. In the absence of further research, such claims not only tenuous, they are absurd.

We can make only two conclusions. First, the marine environment will be adversely affected. Second, there is enormous uncertainty about whether the overall economic benefits will be positive.

Rather than damaging the marine environment we should be protecting and enhancing what is left and using this as a platform to sustainably exploit the enormous potential of tourism and marine recreation. Moving to farming salmon entirely in closed containment would reduce many of the industry's environmental and economic impacts.

Quite modest increases in these activities deliver income and employment gains which are significantly greater than the benefits from further development of open cage aquaculture. Indeed, the SSF proposal is incompatible with this type sustainable economic development

We can say:

- The SFF proposal will create income and employment.
- The marine environment in Wester Ross will be impacted.
- Environmental service flows to other local users of the marine environment (commercial and recreational fishing, wildlife tourism...etc) will certainly be compromised.
- FTEs and GVA in these other economic activities will certainly decline.
- The decline in FTEs and GVA could be less than, or very much greater than, the jobs and income created by the SSF proposal.
- Since the decline in other economic activities is unknown, it would be absurd for SSF (or any firm proposing salmon farm developments) to claim their development will create local income and employment.
- In the absence proper research, neither SSF nor any other firm should not be allowed to make this fundamentally misleading claim.
- If their claims are not substantiated, Wester Ross and Scotland could end up with a poorer economy and an even more damaged marine environment.

At a more strategic / longer term level. From a local perspective economic activity predicated on a resilient and diverse marine habitat offers more economic potential than salmon farm production, and cumulative effects are very damaging of that potential.

